

EBR Review Response: Paris and Galt Moraines

April 2009

Ministry of the Environment

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Ontario

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1. Introduction

1.1. *Summary of the Application*

The purpose of this review was to assess the current protection framework, and to determine whether there is a need for new provincial policy or legislation to protect the Paris and Galt moraines. The Ministry of the Environment (MOE or the Ministry) agreed to undertake this review in response to an application made under section 61 of the *Environmental Bill of Rights, 1993* (EBR). The application, made on May 25, 2007, requested a review of the need to develop new provincial policy or legislation to protect the Paris and Galt moraines in order to protect groundwater recharge in the Upper Grand River watershed and other watersheds located along the moraines. The applicants submitted that a review should be undertaken because:

- Municipalities within the Grand River watershed are dependent on groundwater as the source of municipal drinking water. These municipalities – Guelph, Cambridge, Kitchener, and Waterloo – are designated as urban growth centres in the province's Growth Plan for the Greater Golden Horseshoe, 2006;
- It is critical that the primary groundwater recharge areas in the moraines be protected in order to protect the future drinking water supplies in the area;
- Municipalities designated as growth areas will shortly encroach into the moraines. Comprehensive moraine protection policies need to be in place before municipalities have to deal with subdivision planning applications;
- The Paris and Galt moraines cut across several municipalities (Peel Region, Halton Region, Wellington County, the City of Guelph, Region of Waterloo, Norfolk County and Brant County) and three conservation authorities (Grand River Conservation Authority, Credit Valley Conservation, and Conservation Halton). This inter-jurisdictional complexity warrants provincial leadership in protection policy;
- At least two municipalities – Puslinch in Wellington County and North Dumfries in Waterloo Region – have extensive aggregate resources. Provincial policy leadership is required in analyzing the extent to which the cumulative effect of aggregate extraction negatively impacts groundwater recharge in the moraine areas.

Response letters were sent by the MOE to the applicants on July 26, 2007. The letters indicated that the MOE would review existing policies and the need for new policies related to some of the issues raised in the EBR application. The

Clean Water Act, 2006 which received Royal Assent on October 19, 2006 would not be reviewed. Research and information, however gathered in developing plans under the *Clean Water Act, 2006* informed the review. The response letters also indicated that the Provincial Policy Statement (PPS, 2005), which came into effect on March 1, 2005 and the Greenbelt Plan which was established under the *Greenbelt Act, 2005* would not be reviewed.

1.2. Objectives of the Review

The objective of this review was to assess the current protection framework, and to determine whether there is a need for new provincial policy to protect the Paris and Galt moraines, in particular to protect groundwater recharge in the Grand River watershed and other watersheds located along the moraines from the impacts of urban development and from the cumulative impact of aggregate extraction on moraine groundwater recharge areas. The review examined the current policy system for potential gaps and made recommendations for future action.

1.3. Approach to the Review and Scope

There were two primary aspects to the review: (1) a review of current technical information and knowledge concerning the hydrogeology of the Paris and Galt moraines and identification of gaps in understanding, and (2) a review of existing policies and an analysis of potential gaps related to protecting the moraines. Technical understanding of the Paris and Galt moraines is important in order to identify the key features and functions of the moraines that warrant protection, determine if there are significant information gaps and to assist in the analysis to determine if the policies in place are appropriate.

To carry out the review, the MOE established a review team and an inter-ministry committee, comprising of the Ministries of Municipal Affairs and Housing (MMAH), Natural Resources (MNR), Agriculture, Food and Rural Affairs (MAFRA), Northern Development and Mines (MNDM), Energy and Infrastructure (MEI), and Transportation (MTO).

Consistent with the applicant's request, the MOE set the scope of the review to include an examination of moraines, groundwater protection and aggregate extraction policies applicable to the geographic area of the Paris and Galt moraines. Although a wide range of policies were reviewed, the scope did not include recommending changes to policies that were not within the MOE's mandate (e.g. the PPS, 2005 the Greenbelt Plan, the Growth Plan for the Greater Golden Horseshoe). The scope of the review also did not include

revisiting decisions related to pieces of provincial legislation where decisions had been made within the last five years consistent with the Environmental Bill of Rights (e.g. *Ontario Water Resources Act* including the Permit to Take Water program, *Clean Water Act, 2006*, *Nutrient Management Act, 2002*, *Environmental Assessment Act*). An examination of the implementation of provincial policies informed the review.

The MOE review team examined both provincial and municipal policies, and had discussions with municipal, conservation authority and provincial staff in the analysis of provincial and municipal policies and practices.

In the provincial policy analysis, the review included examination of protection of the functions of the moraines (groundwater recharge, discharge, storage). Policies were examined for: definitions; protection of hydrologic function for drinking water purposes and for ecological purposes; requirements for mapping of recharge, discharge and storage functions; presence of technical guidance for identification and/or delineation of functions; and roles and responsibilities. The review did not include a detailed evaluation of municipal implementation of provincial policy direction.

In addition, a jurisdictional scan was completed and a summary is attached in Appendix 1.

2. Moraines

The term 'moraine' and the need to protect 'moraines' have gained prominence in Ontario since the Oak Ridges Moraine Conservation Plan was implemented in 2001.

Glaciers carry and deposit a variety of geologic debris that is eroded from the landscape that glaciers move over. Some of these glacial deposits are called moraines. The various glacial advances and retreats in Southern Ontario from different ice lobes have resulted in a series of moraine deposits throughout the region. The structure and composition of moraines are a function of their depositional environment and the underlying geological material that the glacier moves over. Moraines can therefore vary considerably in size, shape and geologic composition, as well as aerial extent, height and thickness.

End moraines (or terminal moraines) are ridges of glacial sediment that accumulate along and at the margins of glaciers. More specifically, kame moraines are end moraines that contain numerous hummocky mounds of

irregularly bedded sand and gravel with subordinated till, deposited in patches from meltwater flowing in contact with a moving or decaying glacier. Both the Paris and Galt moraines are characterised as end moraines which were formed from the action of the Ontario ice lobe, which was estimated to be about 5,000 metres thick. Much of the material left by the ice lobe in this area was deposited in the shape of oval hills called drumlins.

Interlobate moraines are formed as a result of large ice sheets advancing irregularly so that their margins are 'lobate', the retreating margins of ice deposit thermal moraines of boulders, clay and sand leaving the original interlobate shape of the glaciers, hence the term 'interlobate moraine'. Both the Waterloo moraine and the Oak Ridges Moraine are characterised as interlobate moraines.

Hummocky moraines are areas of knob and kettle topography that may have been formed either along an active ice sheet or around a mass of stagnant ice. Knob and kettle topography is an undulating landscape in which a disordered assemblage of knolls, mounds, or ridges of glacial debris is interspersed with irregular depressions and pits (kettle) that are commonly undrained and may contain swamps or ponds.

Moraines are often cited for their significance in providing many functions to the environment. Each moraine will provide its own specific functions depending on its size, structure and location. There are a number of functions that are often associated with larger moraines in Southern Ontario and other parts of the Great Lakes Basin. As a result of these functions, moraines provide groundwater recharge, discharge and storage functions, which result in water quality and quantity related benefits, such as:

- Maintenance/improved quantity and quality of drinking water and water for other water users;
- Provision and protection of habitat;
- Filtration of water (runoff/rainfall);
- Maintenance of stream flows and wetlands and resiliency during seasonal and longer terms droughts;
- Decrease of storm flows and downstream flooding; and
- Adaptation to impacts of climate change.

2.1. Context

While much of the Paris and Galt moraines are not subject to development pressures, Guelph and Cambridge are identified as urban growth centres in the Growth Plan for the Greater Golden Horseshoe. Urban growth centres will be planned to achieve, by 2031, residents and jobs gross density targets. In Guelph

and Cambridge, this growth will be primarily outside of the moraines.

The City of Guelph Water Supply Master Plan indicates a need for additional groundwater and/or surface water supplies (2017-2025). Cambridge is examining the opportunity for bedrock wells to meet long term demands and provide resiliency to the existing bedrock supplies. Studies under the *Clean Water Act, 2006* for Guelph and Cambridge well fields are underway, and results are expected in 2010.

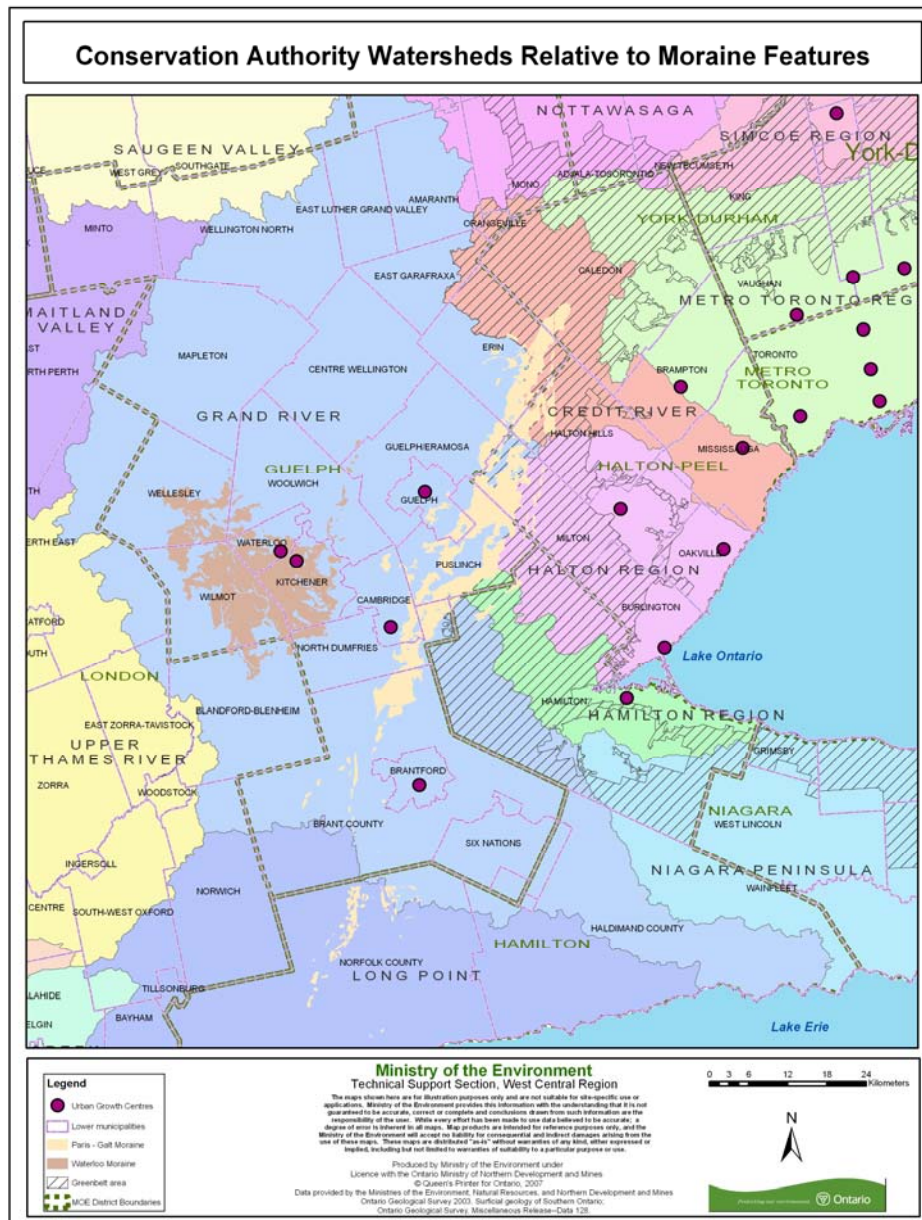
2.2. *Paris and Galt Moraines – Description and Function*

The Paris and Galt moraines extend from north to south west from Caledon to Norfolk County, a distance of about 560 kilometres (Figure 1). Generally, a snake like formation of mixed tills, the moraines are at their widest (about 10 kilometres) near Aberfoyle. Much of the surficial expression of the moraines is discontinuous throughout Brant County. The Paris and Galt moraines are significantly lower in relief than the Waterloo moraine and the overburden thickness can be as high as 30-40m in the Guelph and Cambridge area.

The hummocky nature combined with a relatively permeable surficial geology give rise to high levels of recharge into the Paris and Galt moraines, known to support various coldwater streams and wetlands. Early observations indicate the presence of locally important aquifers along the southern portions of the moraines. Study by the Ontario Geologic Survey (OGS) also indicates the potential for significant aquifers beneath the moraines and above the bedrock between Cambridge and Paris as well as significant bedrock aquifers between Guelph and Cambridge.

Detailed hydrogeology is available only where development (urban, rural residential, major groundwater takings, aggregate extraction) has occurred or is planning to occur. Significant aggregate operations occur in Puslinch Township in the outwash materials between the Paris and Galt moraines.

Figure 1: Map of Paris and Galt Moraines



This map is not the official boundary map of the moraines and was used for discussion purposes in this review. For details on the boundary of the moraines, please refer to Appendix 2.

2.3. Summary of the State of Knowledge of the Paris and Galt Moraines

To initiate the review, the current state of knowledge and existing data on the Paris and Galt moraines were examined. For the purposes of the review, data is defined as the parameters input into models for decision making. Knowledge is defined as a broader understanding of recharge and discharge quantities, groundwater flow/velocity and contaminant transport. (For the detailed study, please refer to Appendix 2.)

Moraine Boundaries

It is not considered necessary to determine the boundaries of the Paris and Galt moraines from a groundwater protection point of view as any functionally significant features should be known or determined independent of the moraine boundaries when appropriate studies are carried out.

Recharge and Storage

Recharge and storage have only been quantified to a limited extent in areas where more detailed subwatershed studies or Tier 2 water budget studies under the *Clean Water Act, 2006* have been carried out. The amount of recharge which makes its way to the underlying bedrock aquifer(s) has not been quantified to any great extent. Recharge should be refined in areas where land use change is expected particularly where it may relate to local groundwater discharge.

Water Supply

A basic understanding of private water supply as it relates to potential aquifers is known. An understanding of potential impacts on municipal water supplies is being undertaken through Tier 3 water budget assessments (under the *Clean Water Act, 2006*) and results are expected in 2010. More significant aquifers may be revealed by Ontario Geologic Survey work currently underway. More widespread monitoring of groundwater levels and baseflow in areas of proposed long term development is necessary.

Monitoring in selected areas of intense gravel extraction does not indicate significant water level impacts.

Maintenance of Ecological Features and Discharge

A general understanding of the groundwater function related to the streams and wetlands exists, and this understanding is enhanced where subwatershed studies have been completed. The Tier 3 water budget studies examine capture zones and recharge areas which supply water for municipal water supplies. The extent to which recharge areas necessary to maintain water-related ecological functions will coincide with recharge areas identified in the studies will be better known once these studies are finalized and source protection plans are

implemented.

Water Quality

Limited water quality data shows elevated nitrate and sodium levels in localized areas. These are attributed to agriculture, septic systems and road salting. In the absence of any major land use changes or water resource demand along the rest of the Paris and Galt moraines the need for additional water quality monitoring may be limited but can be useful in characterizing the groundwater flow systems.

3. How the Moraines are Protected

3.1. *Provincial Legislation and Policy*

The existing provincial policy framework provides for the protection of water resources, including groundwater recharge, discharge and storage functions. A summary of these policies follows.

3.1.1. *Ontario Water Resources Act, 1990*

The purpose of the *Ontario Water Resources Act* (OWRA) is to provide for the conservation, protection and management of Ontario's waters and for their efficient and sustainable use, in order to promote Ontario's long-term environmental, social and economic well-being. There are many tools under the Act which aim to achieve its purpose. For example, water takings over 50,000 litres per day are managed through the Permit to Take Water Program. The construction of wells, including the licensing of well contractors and technicians, is regulated under Ontario Regulation 903 of the *Ontario Water Resources Act*. Certificates of Approval are issued under the Act to persons who are establishing, altering, extending or replacing a new or existing sewage works. In addition to effluent criteria, the approvals contain requirements for the design and build of the works as well as terms and conditions for their operation, maintenance and monitoring. The approvals can also impose other terms and conditions that the owner must meet. Although the Act contains requirements for the protection of water quality and quantity, the OWRA does not specifically refer to the protection of moraine functions (recharge, discharge, storage) as set out in this review.

3.1.2. *Environmental Protection Act, 1990*

The general purpose of the *Environmental Protection Act* is to provide for the protection and conservation of the natural environment. More specifically, the

EPA protects Ontario's water resources from pollution. Under the Act, Directors can issue orders against persons responsible for the discharge of contaminants to the natural environment (including water) beyond levels prescribed in regulations. The authorities provided for under the Act are broad and therefore the Act does not specifically refer to the protection of moraine functions (recharge, discharge, storage) as set out in this review.

3.1.3. *Clean Water Act, 2006*

The *Clean Water Act* (CWA), 2006 came into effect on July 3, 2007. The purpose of the Act is to protect existing and future sources of drinking water. On November 4, 2008, a General Regulation (O. Reg. 287/07) was made under the CWA amalgamating several regulations and requirements of the Act. Under the Act, communities are required to assess drinking water sources for municipal residential drinking water systems and any other systems included in the planning process, identify sources of contamination or water shortages (called drinking water threats), and create and implement a source protection plan to protect both the quality and quantity of these drinking water sources. To date, assessments completed under the CWA (e.g. water quantity Tier 2 assessments) have identified the cities of Cambridge and Guelph as having moderate to significant stress for future water supplies. As such, these areas are subject to more detailed Tier 3 studies, which are currently underway. Results are expected in 2010.

The legislation requires the identification of wellhead protection areas, highly vulnerable aquifers, significant groundwater recharge areas, and surface water intake protection zones for municipal residential systems and other systems. Technical rules made under the Act have established the methods to delineate these protection areas. More specifically, through the preparation of assessment reports, there is a requirement that significant groundwater recharge areas be delineated and mapped. These areas must have a hydrological connection to a surface water body or aquifer that is a source of drinking water for a drinking water system. Therefore, significant groundwater recharge areas connected to a municipal residential drinking water source on the Paris and Galt moraines will be delineated and mapped to meet the requirements of the CWA.

Roles and responsibilities of municipalities and conservation authorities for implementation are clearly defined through the work of the source water protection committees as established by the Act and the regulation. Source protection committees are to determine appropriate policies for the protection against threats in wellhead protection areas, highly vulnerable aquifers, significant groundwater recharge areas and surface water intake protection zones within their source protection areas/regions. Municipalities have a strong role in developing and implementing source protection plans in all areas under municipal jurisdiction. With one-third representation on the source protection

committees, municipalities across a given source protection area/region will work with other members of the committee to identify, assess and address threats to drinking water within their municipal wellhead and intake protection areas. The Act does not give conservation authorities new regulatory or enforcement powers. However, conservation authorities will provide source protection committees with local facilitation, coordination and technical support during the assessment and planning process.

3.1.4. *Environmental Assessment Act, 1990*

The *Environmental Assessment Act* (EAA) provides for the protection, conservation and management of the environment in Ontario by establishing a responsible and accountable process of decision making. The EAA provides a legislative basis for the preparation, submission and review of various types of environmental assessment (EA) documents.

The EAA requires that individual EAs and Class EA parent documents be prepared in accordance with a Terms of Reference which has been approved by the MOE. Once approved, the Terms of Reference provides a framework for preparing the EA or Class EA. Proponents are encouraged, through pre-submission consultation and through the development and review of the Terms of Reference, to incorporate ecosystem principles in their decision making for all types of EAs.

The EA Act requires the Terms of Reference to define the study area and outline a brief description of the environment that may be affected or reasonably expected to be affected, directly or indirectly, by the alternatives and the undertaking. The proponent is to conduct studies/research to provide a final description of the environment within the study area, building upon the description given in the approved Terms of Reference. Generally, each environment is broken down into its component parts, though some overlap between the different environments is possible. For example, in a description of the natural environment, at minimum, geology, hydrogeology and biology will be described. The EA Act requires proponents to outline how the project will attempt to prevent, avoid or minimize adverse environmental effects through the application of impact management measures.

A proponent may apply to the Minister for approval of a Class Environmental Assessment (Class EA) with respect to a class of undertakings, known as a Class EA document. The approved Class EA document establishes a streamlined planning process for proponents to follow in order to fulfill the requirements of the EA Act approval of a project within the class of undertakings. The Class EA approach allows for evaluation of the environmental effects of alternatives to an undertaking and alternative methods of carrying out a project, and expedites the environmental assessment of smaller recurring projects (e.g.,

road widening/upgrading). There are currently 10 approved Class EAs in Ontario covering a range of projects and activities including: municipal infrastructure, transit, provincial highways, forest management, activities in provincial parks, disposition of Crown resources, nuisance species control, fish stocking, shoreline and stream bank stabilization, access roads, hydro transmission lines, modifications to hydroelectric facilities, as well as flood and erosion control projects. Class EA Parent documents are prepared, including a Terms of Reference, and are formally submitted to the Minister for review and approval following the same basic process as used for Individual EAs. Once the Parent document is approved, some project types included in the particular class of undertakings (Schedule A and A+) have pre-approval under the EAA.

Schedule B projects are subject to the Class EA Environmental Screening Process. This process outlines screening criteria that must be used to evaluate certain projects. Surface and groundwater screening criteria include: (1) negative effects on surface quality, quantities or flow; (2) negative effects on ground water quality, quantity or movement; (3) significant sedimentation, soil erosion or shoreline or riverbank erosion on or off site; and (4) potential negative effects on surface or groundwater from accidental spills or releases to the environment.

The technical review of an EA typically considers policies such as the EA Act, the OWRA, the *Pesticides Act* and any associated regulations, policies, area specific Acts, Plans, guidelines, and provincial policies (i.e. Oak Ridges Moraine Conservation Plan, Niagara Escarpment Plan, etc.). If appropriate, groundwater is considered in the technical review with respect to the protection of quantity (i.e. whether users and/or baseflows will be impacted by withdrawals or physical changes to the aquifer) and whether or not controlled or uncontrolled discharges from the undertaking will have negative impacts on area groundwater quality and adversely affect human health (drinking water, household, recreational use, the ecosystem including aquatic life), and water users (industry, agriculture, etc.). Consideration of surface water and the protection of surface water quality against physical, chemical, temperature and geomorphological changes are also considered when appropriate.

3.1.5. Nutrient Management Act, 2002

The Nutrient Management Act provides a comprehensive nutrient management framework for Ontario's agricultural industry, municipalities and other generators of materials containing nutrients that are land applied. The objective of nutrient management is to ensure that nutrients (mainly nitrogen, phosphorus and potassium from manure, chemical fertilizers and septic systems) are wisely used for optimum economic benefit, while minimizing impact on the environment. The legislation gives best management practices the force of law. Best management practices include location requirements for nutrient storage and application (e.g. setbacks from water courses), application rates, requirements for Nutrient

Management Plans and Strategies, and mandatory training and certification.

3.1.6. Aggregate Resources Act, 1990

One purpose of the *Aggregate Resources Act* (ARA) is to minimize adverse impacts on the environment in respect of aggregate operations. The ARA enables the Minister of Natural Resources to initiate studies on environmental and social matters related to the licensing and operation of pits and quarries. The ARA requires operators on private land to acquire a licence to extract aggregate. Prior to the licence being issued or refused, the Minister shall have regard to the effect of the operation of the pit or quarry on the environment and any possible effects on ground and surface water resources. The ARA prohibits wayside pits in areas zoned as having particular environmental sensitivity.

Under the ARA, the Ministry of Natural Resources has established provincial standards which include:

- For new and amended licences/permits proposing to extract near or within the water table, a requirement for a hydrogeological report. Where operations propose to remain 1.5 metres above the water table in the case of a pit or 2 metres in the case of a quarry, a hydrogeological report is not required unless specifically requested by MNR (rare circumstances). The only requirement is a determination of the water table by a qualified person. A qualified person must be a registered professional geoscientist or licensed professional engineer with appropriate training related to hydrogeology.
- If the results of the Level 1 report identify the potential for an adverse effect from the operation, a requirement for a more comprehensive impact assessment (i.e. Hydrogeological Level 2 Report). All Level 2 reports must be circulated to MOE for comment. The Level 2 report assesses the significance of the effect and the feasibility of mitigation.
- A Hydrogeological Level 2 report (an impact assessment) that must:
 1. identify impacts on:
 - water wells,
 - springs,
 - groundwater aquifers,
 - surface watercourses and bodies,
 - discharge to surface water,
 - proposed water diversion, storage and drainage facilities on site, and
 - water budget; and
 2. provide:

- a description of the physical setting including local geology, hydrogeology and surface water systems,
- a description of mitigation measures including trigger mechanisms,
- a description of the methodology
- a contingency plan,
- a monitoring plan,
- an impact assessment, and
- technical support data in the form of tables and figures.

For permits or licences proposing to extract aggregate material from within or near the water table, a hydrogeological report must be prepared by a qualified person (professional geoscientist or licensed as a professional engineer with appropriate training related to hydrogeology).

- In reviewing licences and permit applications and site plan amendments to extract below the water table, both MNR and MOE hydrogeologists examine that sufficient field work was conducted, reasonable geological models were used, an appropriate numeric model (if applicable) was used, and that a comprehensive well survey was conducted. Potential impacts if any on water well supplies and nearby surface water features are also reviewed to ensure that adverse impact to supplies and the quality and flow of receiving water bodies are mitigated. The Provincial Standards requires potential effects to be assessed within the zone of influence for extraction below the water table. Although the term “cumulative impact” is not specifically referred to, the effects of multiple aggregate operations are still considered at the local scale. Consideration at the watershed or sub-watershed scale is generally not considered.

Since 2005, the MNR has participated in a process with the Grand River Conservation Authority (GRCA) and the Ontario Stone, Sand and Gravel Association to develop Best Management Guidelines to Assess Cumulative Impacts of Below Water Aggregate Operations within the Grand River Watershed. This draft guideline outlines a process for local scale and subwatershed scale cumulative effects assessments within the Grand River Basin. While the guideline is not mandatory under the *Aggregate Resource Act*, the parties have agreed to follow these guidelines and monitor its implementation. The Ministry of the Environment has provided input and will participate in the implementation. It is anticipated the draft document will be circulated to municipalities for review later in 2009.

3.1.7. The Planning Act, 2006 and the Provincial Policy Statement, 2005

The *Planning Act* is the legislative framework which sets out ground rules for land use planning in the province. The *Planning Act* outlines decision-making responsibilities for municipalities, the Ministry of Municipal Affairs and Housing

and other decision-makers in the land use planning system and provides a legislative basis for municipalities to prepare official plans and zoning by-laws to guide future land use. The Act provides a review framework for development applications involving changes in land use and the subdividing of land.

The *Planning Act* allows the Minister of Municipal Affairs and Housing to issue policy statements on matters related to land use planning that are of provincial interest. The PPS, 2005 provides clear policy direction on matters relating to land use planning and development of provincial interest. The policies of the PPS, 2005 recognize the importance of a clean and healthy environment, while providing appropriate direction for municipalities to meet the range of land use needs of their communities. Municipal official plans are the most important vehicle for implementation of the PPS. All decisions that affect a planning matter must be consistent with the PPS. The *Planning Act* also requires a review of the PPS every 5 years.

The policies of the PPS, 2005 are designed to help maintain and restore the diversity and connectivity of natural features in an area and the ecological function and biodiversity of natural heritage systems recognizing linkages between and among natural heritage features and areas, surface water features and ground water features. The PPS, 2005 includes provisions to protect water resources using the watershed as the ecologically meaningful scale for planning. The water policies require the identification of surface and groundwater features and hydrologic functions necessary for the ecological and hydrological integrity of the watershed. These features include recharge, discharge and storage areas. Vulnerable and sensitive ground and surface water features and their functions shall be protected, improved or restored through restrictions on development and site alteration. The water policies also require protection of municipal drinking water supplies and designated vulnerable areas.

The PPS, 2005 came into effect on March 1, 2005, and decisions on all applications, matters or proceedings affecting planning matters commenced on or after March 1, 2005 shall be consistent with the PPS, 2005. Municipal official plans must also be consistent with the PPS, 2005. Municipalities are required to update their official plans at least every five years after the plan comes into effect to ensure that the official plan (OP) conforms to or does not conflict with provincial plans, has regard to matters of provincial interest, and is consistent with the PPS, 2005.

Policy 4.10 of the PPS, 2005 provides that the province, in consultation with municipalities, other public bodies and stakeholders will identify performance indicators to measure the effectiveness of some or all of its policies, and will monitor the implementation of the policies, including reviewing performance indicators concurrent with any review of the PPS. The Ministry of Municipal Affairs and Housing, in partnership with other provincial ministers, is developing

performance measures to monitor the effectiveness of the PPS, 2005 and the Greenbelt Plan, (which includes the Oak Ridges Moraine Conservation Plan and the Niagara Escarpment Plan).

3.1.8. *Greenbelt Act, 2005 and Greenbelt Plan*

The Greenbelt Plan, 2005 derives its authority from the *Greenbelt Act, 2005* which allows for the establishment of a Greenbelt area and an accompanying Plan for its management.

The Greenbelt provides permanent protection for 1.8 million acres of environmentally sensitive and agricultural lands across the Greater Golden Horseshoe. The Greenbelt Plan includes the areas covered by the Niagara Escarpment Plan, the Oak Ridges Moraine Conservation Plan and the Protected Countryside lands, as designated in the Plan. The Protected Countryside policies of the Greenbelt Plan provide protection for a Natural System made up of a Natural Heritage System and a Water Resources System.

The Greenbelt Plan's Natural System is comprised of a Natural Heritage System and a Water Resource System. The Natural Heritage System includes areas of the Protected Countryside with the highest concentration of the most sensitive and/or significant natural features and functions. The Water Resource System is made up of both ground and surface water features and their associated functions. The policies of the Plan provide protection for key natural heritage and key hydrologic features and functions, as well as the maintenance of connectivity between the features. The Plan identifies key hydrologic features as permanent and intermittent streams, lakes, seepage areas and springs, and wetlands. Development and site alteration are not permitted within key natural heritage features located in the Natural Heritage System and in key hydrological features throughout the Protected Countryside. Key Natural Heritage features located outside of the Natural Heritage System are subject to the policies of the PPS, 2005.

The Water Resources System policies also provide direction for planning authorities to undertake a comprehensive and integrated approach to the protection of water resources, taking into consideration the interrelationships between and among recharge/discharge areas, aquifers, headwaters and surface waters (e.g. lakes, rivers, streams). Municipalities are also directed to protect vulnerable surface and groundwater water areas in accordance with provincial direction for drinking water source protection. The Plan requires municipalities to work with conservation authorities to complete watershed plans to guide planning and development decisions.

Portions of Peel Region, Halton Region, Wellington County, the city of Guelph and a small portion of Waterloo Region (approximately one third of the Paris and

Galt moraines) are covered by the Greenbelt Plan. Refer to Figure 1 for the location of the Paris and Galt moraines in relation to the Greenbelt area.

3.1.9. Places to Grow Act, 2005 and Growth Plan for the Greater Golden Horseshoe, 2006

The Growth Plan for the Greater Golden Horseshoe has been prepared under the *Places to Grow Act*, 2005 to assist the province in implementing its vision for building stronger, prosperous communities by better managing growth in the region to 2031.

The Growth Plan is intended to build on the PPS and the Greenbelt Plan by directing growth to existing urban areas and by promoting compact development and redevelopment, thereby reducing pressures on natural systems. The protection provided for natural systems under the Greenbelt Plan continues to apply to those lands within the Greater Golden Horseshoe area. The Growth Plan defers to the PPS definition of what comprises a natural system. The Plan calls for provincial ministries, in consultation with municipalities, to identify natural systems in the Greater Golden Horseshoe and develop additional protection policies where appropriate. Planning authorities are encouraged to identify natural heritage features in relation to these natural systems. They are also encouraged to prepare watershed plans and use such plans to guide decisions concerning development of water and wastewater servicing.

3.2. Local Scale Implementation

Municipalities and conservation authorities have a key role in implementing Ontario's policy-led planning system at a local scale.

Municipalities make local planning decisions, prepare planning documents (e.g. official plans, zoning by-laws), and ensure that planning decisions and documents are consistent with the PPS, 2005 and conform to or do not conflict with provincial plans.

An official plan (OP) describes a municipal council's (upper, lower or single-tier) policies related to land use in a community. The municipal official plan is one of the most important vehicles for implementation of the PPS, 2005, the Growth Plan for the Greater Golden Horseshoe, and the Greenbelt Plan. The policy-led framework recognizes the diversity and uniqueness of communities across Ontario. Building upon the policy direction provided in the PPS, 2005 to protect, improve or restore the quantity and quality of water, municipal official plans identify provincial interests and set out appropriate land use designations and policies to achieve comprehensive, integrated, long-term planning. Municipalities

may go beyond the minimum standards set out in the PPS, 2005 to address matters that are important in a specific community or area, provided they do not conflict with the PPS, 2005.

Many municipalities work in partnership with conservation authorities to implement provincial policy direction. Some municipalities have entered into agreements with conservation authorities to obtain technical expertise on a range of matters such as natural hazards, natural heritage, water quality and quantity and groundwater.

Conservation authorities also have regulatory responsibilities under the *Conservation Authorities Act*. Each conservation authority is empowered by regulation to regulate development, interference with wetlands, and alterations to shorelines and watercourses. Development in or adjacent to river or stream valleys, Great Lakes and large inland lake shorelines, watercourses, hazardous land and wetlands may require a permit or a letter of permission from a conservation authority.

Under the *Conservation Authorities Act*, conservation authorities have the authority to study and investigate the watershed and to develop programs to conserve, restore, develop and manage the natural resources of the watershed. In many jurisdictions, conservation authorities, municipalities and provincial ministries work together to develop watershed and subwatershed plans.

Watershed, subwatershed and tributary scale management are key to protecting, improving and/or restoring the ecological and hydrological functions of a watershed, and therefore, the key tools for implementing provincial policy direction. The watershed is the ecologically meaningful scale for planning and a relevant boundary for considering hydrologic features and functions. As part of water management, watershed studies and plans provide a broad understanding of ecosystem function and status and recommend actions for appropriate land and water management in a watershed. Watershed planning can help incorporate relevant ecosystem considerations into land use planning and decision-making to improve or restore the ecological and hydrological integrity across the watershed.

4. Conclusions

The Ministry has undertaken the Environmental Bill of Rights Review which provides an overview of the current legislation which applies to the protection of water resources on the moraines. This review also furthers the understanding of the functions of the Paris and Galt moraines and their interactions and as such is

beneficial to other government agencies, municipalities, conservation authorities and stakeholders. The hydrogeology background report (Appendix 2) presents the state of current knowledge of the Paris and Galt moraines including boundaries, geology, hydrogeology, recharge and storage, water supply, maintenance of ecological features, water quantity and budget and water quality. In addition, the report provides an understanding of key science considerations such as the importance of scale in hydrogeology evaluations and discussions on ecological reserve. The report supports the use of monitoring data to guide future planning and land use policy, and will assist in the development of technical guidance documents.

The Ministry's review concluded that new provincial policy or legislation is not required to protect the functions of the Paris and Galt moraines at this time. Protection of groundwater recharge in the Upper Grand River watershed and other watersheds located along the Paris and Galt moraines is required by existing provincial policies such as the *Clean Water Act, 2006*, the Provincial Policy Statement, 2005, the Greenbelt Plan, and augmented by more general policies for the protection of water quality and quantity such as the *Ontario Water Resources Act*.

Implementation of the *Clean Water Act, 2006* is ongoing, and it is therefore too early to comment fully on its implementation. Nevertheless, the CWA is expected to address most of the applicants' concerns about drinking water once source protection plans are prepared and implemented. The extent to which recharge areas necessary to maintain water-related ecological functions will be protected through source protection plans will be better known once these plans are finalized.

Additional detailed studies to examine water supplies are underway, and results are expected in 2010. The report "Review of the State of Knowledge for Waterloo and Paris Galt Moraines", appended to this report, includes a discussion of the need to analyze existing data and ensure monitoring is in place to monitor and assess future growth implications. Please refer to Appendix 2 for details.

Path Forward

The Ministry of Environment will undertake, in collaboration or consultation with partner ministries, First Nations and stakeholders, the development of guidance materials to assist with the implementation of policies protecting hydrologic functions (e.g. policies in the Provincial Policy Statement). The Ministry of Environment will establish a process with partner ministries, First Nations and stakeholders to determine the extent and scope of the guidance required.

Appendix 1: Jurisdictional Scan

To supplement the policy analysis, a jurisdictional scan was completed. The scan focussed on policies related to protecting moraines or other similar groundwater recharge areas, including the Oak Ridges Moraine Conservation Plan.

Oak Ridges Moraine Conservation Plan

The Oak Ridges Moraine Conservation Plan (ORMCP), released in 2002, is an ecologically based plan that provides land use and resource management direction for the 190,000 hectares of land and water within the Oak Ridges Moraine (Moraine). In addition to land use restrictions in wellhead protection areas and areas of high aquifer vulnerability, the Plan requires that watershed plans be completed by municipalities. The plans must include a water budget and water conservation plan as well as land and water use management strategies. Major development is prohibited unless the watershed plan has been completed and a water budget and conservation plan has demonstrated the water supply needed for the development is sustainable.

Applications for major development shall not be approved unless the applicant identifies hydrologically sensitive features (including permanent and intermittent streams, wetlands, kettle lakes, and seepage areas and springs) and related hydrologic functions and how they will be protected. Applications must also demonstrate that water supply is available without compromising the ecological integrity of the Plan area, and provide a water budget and conservation plan for the site and surrounding lands.

All development and site alteration with respect to land within a hydrologically sensitive feature and a minimum vegetation protection zone is prohibited, with some exceptions. Hydrological evaluations are required for development or site alteration with respect to the minimum area of influence for hydrologically sensitive features which shall demonstrate, among other things, that no adverse effects on the feature, planning and design techniques to maintain, improve and restore the health of that feature.

All development and site alteration with respect to land in a subwatershed (outside of Settlement Areas) is prohibited if the development/alteration would cause the total percentage of impervious surfaces of the subwatershed to exceed 10% or any lower percentage specified in the applicable watershed plan. Applications shall consider the importance of ensuring natural vegetation is maintained, and where possible, improved or restored and that impervious surfaces, and their impacts to water quality and quantity are minimized.

The province has developed a set of technical papers to assist in the

implementation of the ORMCP. These papers provide guidance on the preparation of watershed plans and water budgets, on imperviousness at a subwatershed scale, and on maintaining connectivity between natural heritage and hydrologic features, as well as other matters.

The majority of municipal ORMCP official plan and zoning by-law conformity amendments are now in place. The effectiveness of the ORMCP is monitored in part through the Monitoring the Moraine (MTM) initiative. The MTM is a collaborative community-based project coordinated by Save the Oak Ridges Moraine (STORM), Citizen's Environment Watch (CEW), and the Centre for Community Mapping (COMAP). The MTM initiative engages volunteers in measuring changes to the landscape of the moraine as a result of the ORMCP. It also aims to ensure that reporting of the information gathered through the process is communicated to other stakeholders.

The MMAH sits on the MTM advisory committee to provide advice on the project, exchange information and ensure there is coordination between local and provincial monitoring initiatives. Under the Greenbelt Plan, 2005, MMAH is committed to developing a performance monitoring framework for the entire Greenbelt Plan area, including the Oak Ridges Moraine.

Other Jurisdictions

An examination of jurisdictions found moraines in Alberta, Minnesota, Wisconsin, Michigan and Ireland. A summary of policies related to moraine protection follows.

The Cooking Lake moraine is located in central **Alberta** and encompasses all of Elk Island National Park. The Strathcona Country's 'Municipal Development Bylaw' calls for the identification, conservation, and protection of environmentally sensitive land, the protection of watersheds to maintain water quality and quantity of surface and groundwater systems, and for the protection of lands, through instruments and policies, where sensitive groundwater resources have been identified. Moreover, the local development plan recently re-designated the moraine area to a special policy area to further restrict subdivision capabilities. There are no specific policies for the protection of moraines in Alberta.

Minnesota has three moraines – the Pines, the St. Louis, and the Coteau moraines. Minnesota statutes contain direction for the long term coordination of water planning activities between local, regional and federal bodies. State authorities are to ensure that groundwater water quality monitoring and related data is provided and integrated into the state's land management information system. There are no specific policies for the protection of moraines in the state.

Wisconsin's "Kettle Moraine" is protected by the state's groundwater protection statute. The *Groundwater Protection Act* enables a protection program which

includes a set of standards based on a list of substances; regulatory programs to which state water authorities must comply (e.g. water, wastewater, site remediation, fuel storage); aquifer characterisation requirements (e.g. potential use, vulnerability); local groundwater management (e.g. authority for zoning, ordinances, well replacement and maintenance); and monitoring, research, and coordination. In 2008, Wisconsin's Groundwater Coordinating Council was required, by statute, to submit an annual report describing the current groundwater quality of the state, assessing groundwater management programs, and providing information on implementation. There are no specific policies for the protection of moraines in Wisconsin.

Glacial landforms dominate the surface of most of the state of **Michigan**. The state has several programs in place for the protection of drinking water. The Source Water Assessment Program, which is enabled by the *Safe Drinking Water Act*, identifies areas that supply public water, inventories contaminants and assesses water system susceptibility to contamination, and informs the public of the results. A water wellhead protection program is also in place to assist local communities utilizing groundwater for their municipal drinking water supply systems in protecting their water sources. A well construction and decommissioning program is also implemented. Finally, Michigan has a groundwater discharge program to regulate discharges to groundwater. There are no specific policies for the protection of moraines in the state.

Ground and Rogen moraines are common in **Ireland**. Groundwater protection policies have taken into consideration current European policy for the protection of groundwater. Components of the policy include: zoning land according to classification of groundwater vulnerability to pollution; source protection by means of groundwater protection zones; specific policy statements on the control of groundwater quantity and quality, including groundwater abstraction, as well as waste disposal, contaminated land and other potentially polluting sources; and monitoring, databasing and analysis. There are no specific policies for the protection of moraines in Ireland.

Based on this review related to moraines in other the jurisdictions, it seems that there are a number of policies for the protection of groundwater and surface water resources, however, with the exception of the Oak Ridges Moraine Conservation Plan, there are no other policy statements intended specifically for moraine protection.

Appendix 2: Review of the State of Knowledge for Waterloo and Paris Galt Moraines

Report prepared by Blackport Hydrogeology Inc., Blackport and Associates Ltd.,
AquaResource Inc.